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Oral Abstracts

(Alphabetical order by primary author last name)

The Northeast Stream Temperature (NorEaST) Inventory

Dave Armstrong
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Climate change is expected to alter stream temperature and flow regimes over the coming decades, and in turn influence distributions of aquatic species. Effects of climate change on streams are expected to vary both spatially and temporally and will also be influenced by landscape factors such as geographic setting. To better account for these changes, there is a need to inventory, compile, and collect both short- and long-term stream temperature data in order for managers to gain an understanding of baseline conditions, historic trends, and future projections. The U.S. Geological Survey and University of Massachusetts are currently working towards development of a coordinated, multi-agency regional stream temperature framework and database for states across the Northeast Climate Science Center (NECSC) region – which includes all of the states participating in NEAEB, among others. Objectives of the NorEaST project include 1) compiling metadata about existing stream temperature monitoring locations; 2) developing a web-based decision support mapper to display, integrate, and share information; 3) building a community of contacts with interest in this effort; and 4) developing data portal capabilities that integrate stream temperature data from several sources. As of January, 2013, the NorEaST project has collected information on over 7500 locations and have built a community network that understands and encourages the use of these data. Results from this project will provide opportunities to coordinate stream monitoring efforts and provide basic information to plan for and assess the effects of climate change on streams.

Pros and cons of using measured versus simulated streamflows

Dave Armstrong
U.S. Geological Survey, New England Water Science Center

The Ecological Limits of Hydrologic Alteration (ELOHA) framework is grounded in the premise that increasing degrees of alteration in streamflows from the natural flow regime are associated with increasing ecological change (Poff and others, 1997; 2010). Quantifying the ecologic response to flow alteration can be a challenge, however, because natural streamflow conditions are seldom known, and ecological data are rarely collected at the same sites as flow data (Arthington and others, 2006; Carlisle and others, 2010, 2012). Consequently applications of the ELOHA process have generally required simulation of both natural and altered streamflows for sites that have ecologic samples (e.g. Armstrong and others, 2010). Simulated streamflows are typically determined using a variety of methods such as rainfall–runoff models, regression equations, and other statistical techniques. Most of these approaches rely upon flow information from streamflow gages at r eference sites. Though major progress has been made in simulating flows, estimation of continuous streamflow time series is still uncertain, particularly for extreme low or high flows. Therefore it is important to quantify differences that arise due to model error from true differences between natural flows and altered flows. In addition to direct flow modifications (withdrawals, returns, dams,) and indirect flow modifications (deforestation, runoff from impervious surfaces), other factors also create uncertainty in the determination of flow alteration–ecological response relations. For example, stream temperature, water quality, physical habitat

degradation, sediment, and invasive species may cause substantial impact in ecologic communities even with minimal flow alteration (Dunham et al. 2002).

The Effect of Temperature and pH on the Growth of Variable-leaf Milfoil (Myriophyllum heterophyllum)

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A fundamental part of invasion biology is the prediction of the potential spread of invasive species. This is due to the negative ecological, economic and human-health effects that invasive species may cause. Variable-leaf Milfoil (Myriophyllum heterophyllum), a newly listed invasive species to the Northeast (since 2009), is native to southern U.S. states from Florida to New Mexico, and has since spread to North Dakota and southwestern Quebec, without becoming invasive to those areas. Variable-leaf Milfoil (VLM) is spreading in the Adirondack Park in Northern New York, and its invasive potential is unknown. Based on the geographic distribution of native VLM in some warmer lakes with alkaline waters, it is reasonable to hypothesize that increased temperature, predicted by current climate change models, combined with a low pH in Adirondack lakes would likely increase the growth of VLM. This study examines whether temperature and pH have an effect on the growth of VLM. In this laboratory experiment, the growth of 80 VLM fragments was examined in warm (33.1275°C) and cool (23.135°C) temperatures, combined with 10 pH treatments. Contrary to our hypotheses, there was no significant effect of pH on VLM growth or biomass allocation. Additionally, total biomass growth and allocation to lateral growth were significantly greater in the cool water treatment. We can conclude from our data that VLM vigor is relatively unaffected by pH, but is reduced by water temperatures in the upper range of what might be expected under a climate change warming scenario.

Adoption of Stream Flow Standards and Regulations: A View from Connecticut

Christopher Bellucci and Mary Becker
Connecticut Dept. of Energy & Environmental Protection

In 2005 the Connecticut General Assembly passed Public Act 05-142 which required the State Department of Energy and Environmental Protection (DEEP) to work with the State Department of Public Health and stakeholders to update standards for maintaining minimum flows in rivers and streams. The Public Act requires these stream flow standards to balance the uses of water by providing for river and stream ecology, wildlife and recreation while providing for the needs and requirements of public health, flood control, industry, public utilities, water supply, public safety, agriculture and other lawful uses of water. Extensive effort by DEEP, numerous stakeholders and work groups culminated in revised Stream Flow Standards and Regulations in December 2011, six years after passage of PA 05-142. The newly adopted regulations set the stage for better water management by balancing ecological and human needs including: 1) classification of all streams in the state based on the degree of alteration from the natural hydrograph; 2) dam release rules that are dependent upon stream flow classes and important bioperiods; and 3) providing a predictable blueprint for future water availability to meet human needs.

Exploring Two Chlorophyll-a and Total Phosphorus Collection Methods for NH Lakes and the Potential Impact on Aquatic Life Use Assessments

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NH Dept. of Environmental Services

Documentation of chlorophyll-a (Chl-a) and total phosphorus (TP) is a critical component in the assessment of aquatic life use support in lakes and ponds. In 2009, the NH Dept. of Env. Services (NH DES) developed numeric thresholds for Chl-a and TP to translate its narrative aquatic life use support criteria. Two lake survey data sets, generated by slightly different Chl-a and TP sample collection methods, one from NH DES and the other from the University of New Hampshire (UNH), were used to develop Chl-a and TP thresholds for lakes and ponds according to trophic class. A subsequent review of the data revealed the potential for alternative aquatic life use outcomes related to these differences in methodology. To better understand the magnitude and time of the differences, NH DES completed the first year of a two-year project in 2012 looking at Chl-a and TP data collected according to both methods simultaneously in 12 mesotrophic lakes. Early results indicate differences in both Chl-a and TP collection methods for mesotrophic lakes. The NH DES sampling method tends to result in higher Chl-a concentrations while the UNH sampling method tends to result in higher TP concentrations. The preliminary findings suggest that lakes primarily sampled by NH DES are more likely to exceed Chl-a thresholds, while lakes sampled primarily by UNH are more likely to exceed TP thresholds for aquatic life use support. The purpose of the presentation is to provide results from year one and seek recommendations for the most appropriate Chl-a and TP methodologies to accurately assess aquatic life use support for NH's lakes and ponds.

Effects of Flow Alteration on Stream Health across the Atlantic Highlands Ecoregion

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The effects of streamflow alteration on aquatic ecosystems in the Northeast U.S. are not well understood, even though the need to quantify these relations is essential when making scientifically-based management decisions for water resources, especially in light of projected changes in climate, water availability, and water use. The USGS has prioritized the need to better understand the ecological effects of streamflow alteration in the near future. Accordingly, we are planning an investigation to characterize streamflow alteration at about 70 gaged streams across the Atlantic Highlands Ecoregion (Maine to Pennsylvania), and to evaluate how streamflow alteration relates to aquatic ecosystem health. Stream ecology will be based on data from physical habitat assessments, field parameter measurements, water chemistry samples, and surveys of algal, macroinvertebrate, and fish assemblages. Temperature probes deployed for one year will be used to quantify thermal regimes. Data from streamgaging records will be used to calculate hydrologic metrics for each site. The degree of streamflow alteration will be calculated by comparing actual (observed) flow characteristics to modeled (expected) natural flow characteristics. These comparisons will result in a series of observed/expected ratios (O/E) for individual hydrologic metrics, where a value of 1 indicates unaltered (natural) flows, <1 indicates depleted flows, and >1 indicates inflated flows. By correlating indicators of aquatic biological condition (e.g., macroinvertebrate IBI) to O/E values of hydrologic alteration, the relation between

stream health and the degree of flow alteration is inferred. This talk outlines the study design, with examples from a similar study in the Western U.S.

Establishing Maine's Flow Standards Using the Natural Flow Regime and Aquatic Life Requirements.

Dave Courtemanch
The Nature Conservancy, Brunswick, Maine

Maine has established statewide stream flow regulations with statutorily required objectives of being "protective of aquatic life" and "based on the natural variation of flow and water levels". The regulation is unique by its establishment of six seasonal flows based on life stage requirements of salmonids and certain diadromous species. The amount of water required to be maintained varies by season and water quality standards for each waterbody. Using The Nature Conservancy's Indicators of Hydrologic Alteration (IHA) software and a 60+ year flow record for the Sheepscot River in Maine, a model was produced to show how application of the flow criteria could affect specific Environmental Flow Components (EFC) of the IHA and assess how the regulations may perform for the protection of certain species.

Selecting Vermont's Best Lakes

Jeremy Deeds, Kellie Merrell
Vermont Department of Environmental Conservation

The Vermont Department of Environmental Conservation recently went through a process to identify high quality lakes in the state to prioritize conservation and protection efforts. Lakes were independently ranked in three separate categories using long-term datasets for water quality, biological diversity and unusual or scenic natural features. Scores from the separate categories were combined to identify lakes with exemplary qualities in all three. The final list of "best lakes" has implications for conservation, watershed planning, and policy decisions regarding tiered aquatic life uses and water quality management typing.

Monitoring Aquatic Invasive Species in Rhode Island

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NEIWPCC & RIDEM Office of Water Resources

Since 2007, the Rhode Island Department of Environmental Management's Office of Water Resources has expanded aquatic invasive species (AIS) monitoring in the state. Initiated in 2007 by increased public awareness of the problem, the office began an effort to characterize the extent of freshwater invasives in RI by identifying the species present at various access points, and the distribution of the species throughout the state. The project has expanded over the last five years to include lake shoreline surveys at most publicly accessible lakes where there is a boat ramp and even at "shore access only" fishing areas. Results of the monitoring project show invasives are present at greater than half of the monitoring locations with the most common species being variable milfoil and fanwort, but at least 13 invasvie species have been found in RI (Eurasian milfoil, curlyleaf pondweed, spiny naiad, inflated bladderwort, water chestnut, water hyacinth , water lotus, parrotfeather, Brazilian elodea, mudmat, yellow floating heart and Asian clam in addition to the aforementioned). This talk will describe the evolution of the program, resulting AIS distribution maps and use of the data for public education as

well as reporting in the State's Integrated Water Quality Monitoring and Assessment Report. More information is available on the website: http://www.dem.ri.gov/programs/benviron/water/quality/surfwq/aisindex.htm.

Maine Volunteer River Monitoring Program

Mary Ellen Dennis

In 2009, the Maine Department of Environmental Protection (DEP) started a Volunteer River Monitoring Program (VRMP). Prior to this, there were a number of volunteer groups monitoring on their own. Other groups were interested, but did not have the resources to monitor without assistance. DEP had been accepting data from a very limited number of established groups with Quality Assurance Project Plans (QAPPs). The purpose of the VRMP was therefore to expand volunteer monitoring efforts by providing a standardized approach to monitoring which includes the following. Volunteer sampling is governed by a VRMP Program level QAPP. The VRMP works with volunteer groups to develop individual Sampling & Analysis Plans (SAPs) tailored to their specific project. Volunteer groups primarily use monitoring equipment loaned by the VRMP who provide overall calibration and maintenance. All volunteers are required to attend an annual volunteer training session. Quality assurance/quality control of data is maintained through a series of QA/QC steps. After review by the group's data manager, electronic data and field sheets are sent to DEP. DEP provides a rigorous review of the data before acceptance and upload to a centralized database. The VRMP produces an annual report for each volunteer group. The data may also be used for inclusion in the Integrated Water Quality Monitoring and Assessment Reports (305(b)) reports).

Network-based prediction of lotic thermal regimes across New England

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Thermal regimes are a critical factor in models predicting effects of watershed management activities on fish habitat suitability. We have assembled a database of lotic temperature time series across New England (> 7000 station-year combinations) from state and Federal data sources. Using principal component analysis, we reduced 78 thermal metrics from the ThermoStat software package to four independent fish habitat predictor variables ial shading from the riparian zone as a function of percent canopy cover and channel width by land-use category. Predictor variables for stream temperature metrics include air temperature metrics, watershed area, surface water storage, drainage density, elevation, percent watershed in coarse deposits or well-drained soils, local and main channel slope, estimated stream flow, potential monthly solar radiation (corrected for topographic shading as well as riparian zone influences), and percent impervious area. Predicted thermal regime variables will be used as input to models that predict relative abundance of selected fish species, chosen based on their sensitivity to urban development. Predicted versus observed fish community composition will be compared for watersheds in which best management practices have been applied.

Refining macroinvertebrate community metrics for assessment and protection of headwater streams in New York State

Brian Duffy
New York State Dept. of Environmental Conservation

Historically, biological monitoring and application of multi-metric indices for water quality assessment using aquatic macroinvertebrates in New York State has focused on moderate to large rivers. Current community metrics for assessment of wadeable streams (species richness, EPT richness, Hilsenhoff's biotic index, Order-Percent Model Affinity) are calibrated toward these larger waterbodies and are not sensitive enough to protect naturally less productive, headwater streams. Cluster analysis of macroinvertebrate community data from least impacted sites across the state were used to define geographic and drainage basin breakpoints for application of headwater stream metric thresholds. Analysis indicates four distinct headwater regions and four corresponding sets of metric thresholds. These regions include the Adirondacks, Catskills, Croton River basin, and the statewide lowlands. Except for the low elevation Croton River basin, headwater conditions were defined as >1000 feet elevation and <6-10 square miles drainage area. Preliminary evaluation of refined metric thresholds indicates the greatest ability to separate reference and non reference condition was found with the headwater multi-metric indices for the Catskills and statewide lowland region.

Increases in Dissolved Organic Carbon Accelerate Loss of Toxic Al in Adirondack Lakes Recovering from Acidification

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Increasing pH and decreasing Al in surface waters recovering from acidification have been accompanied by increasing concentrations of dissolved organic carbon (DOC) and associated organic acids that partially offset pH increases and complicate the use of acid-neutralizing capacity as an index of acidification. To better understand the processes of recovery, monthly chemistry from 47 lakes in the Adirondack region, NY, collected from 1994 to 2011, were used to (1) evaluate effects of increasing DOC concentrations on measurements of the base-cation surplus (BCS), calculated acid-neutralizing capacity (ANCcalc), and acid neutralizing capacity by Gran titration (ANCGran) and (2) use this information to assess the role of DOC in trends of toxic inorganic monomeric Al (IMAl). Of the three indices, the BCS was most effective for describing changes in IMAl relationships from higher DOC. Over the study period decreases in IMAl were observed that were great er than expected from the decreases in strong acids. The IMAl fraction of total monomeric Al decreased from 57% in 1994 to 23% in 2011 from higher DOC concentrations that increased organic complexation of Al. Increasing DOC has accelerated recovery in terms of decreasing toxic Al beyond that directly accomplished by reducing strong mineral acids.

Estimate the Fertilizer Loading to Lakes

Ken Edwardson
New Hampshire Dept. of Environmental Services

Somebody stops you in the hall and asks whether your lakes are showing any nutrient related problems. Falling into the trap you say, 'Yes', to which they reply, 'Show me the data!' Before parting ways they

ask, 'So what is the phosphorus loading to our lakes from lawn fertilizer?' Not learning from your previous mistake, you say that you are not sure but we can figure that out. 'Great, I testify to the legislature next week.' Time to leverage the tools (ArcGIS & loading models) and data (NLCD, DEMs, WQ, 305b) at your disposal to come up with a fast but robust estimate of phosphorus loading from lawns and lawn fertilizer. From the 305(b) we find that 65% of the lakes in the NHDES Volunteer Lake Assessment Program (VLAP) have undesirable levels of nutrients based on one or more nutrient indicators (chlorophyll a, dissolved oxygen, and cyanobacteria blooms). Yet, the average VLAP watershed is only 1.9% lawn. Modeling estimates suggest th at the use of phosphorus containing fertilizers on lawns result in 2X the natural phosphorus loading to the average VLAP lake. A switch to zero phosphorus fertilizer would reduce lawns impact to 1.3X the natural phosphorus loading. Next time you get hit with an impromptu question, hope it is this intriguing.

Pilot wetland condition assessment of palustrine emergent marshes in the Upper Hudson River watershed

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New York Natural Heritage Program

To initiate a wetland condition monitoring effort in New York, the New York Natural Heritage Program piloted condition assessment protocols that follow the EPA's three-tiered approach. We selected and refined metrics at three scales s, notably Mean C (Level 3). We also characterized the vegetation using descriptive statistics and ordination. Finally, we compared the results from all Levels to each other to validate our methods. We used our detailed results from the Level 3 sampling to validate the two levels above, and, similarly, used the EIA scores to evaluate the LCA model. Relationships among metric scores were evident, but were relatively weak because of our small sample population of generally high quality wetlands. We propose methodological refinements at each level, and conclude that this assessment model does establish a solid methodological framework for wetland evaluation in New York.

Stewardship Initiative GIS Tool (SIGT)

Austin Fisher
Fountains Spatial, Inc.

This presentation will highlight key aspects of a project to develop a web-based GIS site selection tool for use by the Long Island Sound Stewardship Initiative. The main objective of the project was to develop a GIS tool that can be used to identify sites (e.g., tax parcels) in the Long Island Sound watershed study area, which should be prioritized for protection, enhancement, and/or restoration. This application was developed using ArcGIS Server with the Flex API. It is fundamentally a site suitability model-building tool, designed to evaluate geographic criteria relevant to the identification of sites for stewardship. It employs a very flexible design, supporting the inclusion of a wide range of input data and a virtually unlimited number of user-defined models. These models are based on a set of one or more geographically significant criteria. Each criterion is based on a geographic relationship established between a GIS layer and the candidate sites being evaluated. The geographic relationships are defined by selecting from a set of spatial analysis operations. Numeric scores are then assigned to the potential outcomes of each criterion. Each candidate site is analyzed and scored based on the criteria comprising the model, and a final score is calculated by totaling the values for each of the criteria.

Monitoring the biological response to Copper Mine mitigation efforts at the superfund Elizabeth Mine in Strafford Vt

Steve Fiske
Vermont Department of Environmetal Conservation

The primary purpose of this monitoring is the reporting out of the biological integrity of these stream reaches, and an assessment of the Aquatic Life Support (ALS) as it relates to the management goals in the VT Water Quality Standards for Class B waters. A summary of the fish and macroinvertebrate collections from stream sites on the West Branch Ompompanoosuc River and Lords Brook (LB). These sites have been established by the VTDEC to track the biological condition of these streams during remediation activities at the Elizabeth Copper Mine site. The impact of the Elizabeth Copper Mine on the WBOR aquatic life was first reported in 1986 by Vermont Department of Environmental Conservation (VTDEC). Toxic concentrations of copper and iron from the mines tailing piles were found to have a severe impact on the macroinvertebrate and fish communties. In addition thick iron percipitate was also likely causeing a physical impairment to the macroinvertrbate habitat of the stream bed. Mitagation efforts began in 2004, and several stream sites have been sampled annualy since. The 2010 assessments showed the first significant level of improvement in the biological condition on the WBOR below the Elizabeth Copper Mine site. For the first time both the fish and macroinvertebrate communities have met the Class B good Vermont Biocriteria Guidance threshold for ALS 1.4 miles below the mine site. T.S. disrupted sampling aforts in 2011, however the mitagation efforts were completed in this year. This presentation will report on the biomonitoring results of 2012, and evaluate the level of recovery of the fish and macroinvertebrate communties. The analysis of these data will occur over the next few weeks and be presented to you for first time at NEAEB 2013, at which time this abstrate will be updated.

Scientific Methods to Measure Phosphorus in Freshwaters

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Connecticut Dept. of Energy & Environmental Protection

CT DEEP has proposed strategies for phopsohorus limits in support of both CT Public Act 12-55 and the Federal Clean Water Act.Connecticut originally proposed a technologhy based limit,but has now developed a biologically based control strategy for phosphorus. Phosphorus limits are based on a watershed approach with the majority of phosphorus reductions being required at the Muniicipal POTWs.

Heterogeneity of Phosphorus in Aquatic Sediment

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Conventional thinking of phosphorus in aquatic sediments considers phosphorus, an internal loading nutrient most often responsible for harmful algae bloom formation in freshwater, as concentrating within the deepest part of a water body only to be released under summer, anoxic conditions. The author's field testing, laboratory results, and published literature findings by other authors document that phosphorus occurrence in and release from aquatic sediments can be spatially and temporally highly variable over a given water body. Areas of elevated phosphorus in sediment can be concentrated in shallow aerobic parts of a water body at the end of one year then released and taken up by algae or

nuisance plants the following year, only to be deposited again at the end of the growing season at altogether separate and concentrated area(s) of the same water body, with the process repeating each year. Field and laboratory analysis of surface water, sediment and algae collected from a lake between June 2010 and November 2012 documented the spatial and temporal heterogeneity of phosphorus in the lake, its release from sediment, and patterns of harmful algae blooms in the lake as a whole. By understanding the heterogeneity of phosphorus in aquatic sediment, areas of elevated phosphorus can be identified and efficiently removed in a controlled manner to reduce the magnitude of future harmful algae blooms or nuisance plant growth.

Bug Catching for the State: Gathering Baseline Information under WAVE

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In the ongoing process of establishing and maintaining water quality, state regulators have been challenged by a general lack of information about the condition of our nation's waters. This dilemma largely results from inadequate resources to conduct water quality investigations. Presently, state regulators lack water quality information for thousands of miles of water resources. One recent but largely untested trend to correct this informational deficiency converges the reach of citizen monitoring with the efficiency of indicator species analysis. This presentation will highlight state and federal efforts to evaluate the biological health of streams though the collection and identification of macroinvertebrate indicators by citizen volunteers. This presentation will identify the basic regulatory principles at stake and evaluate the numerous quality assurances set in place by different programs to ensure reliable data.

Cameras, Satellites, and Surveys: A Multi-Platform Approach to Monitoring Lake Conservation Behavior

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Shoreline buffers are essential to maintaining lake water quality and there are numerous methods for their assessment. There is uncertainty in the benefits and drawbacks of different shoreline buffer assessment methods. In this study I explore three methods of remotely assessing shoreline buffers in the Belgrade Lakes Region of Maine: household surveys, geotagged shoreline photos, and satellite imagery. By comparing these three methods I will evaluate their accuracy and applicable scale when used to assess the presence and quality of shoreline buffers. I used both parametric and non-parametric analysis to (1) evaluate the relative accuracy of 154 household surveys in identifying buffer presence or quality, (2) compare experts in their evaluation of 98 geotagged photos of buffers, (3) assess the accuracy of approximately 450 million square meters of classified Geoeye-1 imagery, and (4) compare the three buffer assessment methods across lakes and demographic factors. Relative to an expert assessment, shoreline residents similarly identified the presence of buffers but significantly differently estimated their extent and quality. Experts differed in how they assessed the extent and quality of buffers. Classified satellite imagery did not significantly predict an expert assessment of buffer presence or quality. These findings suggest that household surveys and geotagged shoreline photos are valuable tools for evaluating shoreline buffers. Satellite imagery is informative at a lake or watershed scale, but

has limitations at a lot scale. I will discuss potential solutions, and research opportunities, to the limitations found with satellite imagery.

How effective are watershed signs anyway?

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Watershed signs are common throughout the country. In general, the broad purpose of signage projects is to a) enhance public awareness of particular water bodies and of watersheds in general, and b) promote stewardship through changes in attitudes and behavior. However, there are remarkably few quantitative evaluations of how effective watershed signs have been in achieving these objectives. To evaluate the impact of watershed signs on resident knowledge, attitude and behavior, we surveyed over 400 pedestrians in a small (0.9 sq. mi) impaired urban watershed in Burlington, VT. Using a brief (6 question) questionnaire in a pre-/post- design, we found that watershed signs had two statistically significant effects among respondents itude (as relative importance of local water quality protection) did not differ significantly between pre- and post- signage samples, perhaps because pre-sign attitude levels were already elevated. A more detailed analysis of responses stratified by neighborhood (differing house values and ownership patterns) is underway.

Using passive sonic receivers to understand habitat utilization of walleye (Sander vitreus) and smallmouth bass (Micropterus dolomieu) in the tributaries and outlet of Onondaga Lake, Syracuse, NY (2010-2012)

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Onondaga Lake supports a diverse warm water fishery that includes approximately 40 species captured annually. Walleye (Sander vitreus) were the most abundant species captured in gill nets from 2008-2012, representing an average of 36% of the catch. Smallmouth bass (Micropterus dolomieu) were captured much less frequently, representing an average annual catch of 1.75% in gill nets. Walleye (N=30) and smallmouth bass (N=7) were implanted with sonic telemetry transmitters in May 2010 and 2011 to track fish movements and habitat utilization in the Onondaga Lake system. Submersible Ultrasonic Receivers (SURs) were located in the Lake Outlet, Inner Harbor (Onondaga Creek), Nine Mile Creek, and Harbor Brook. The greatest amount of activity was recorded in the Inner Harbor and Lake Outlet over the course of the study. Based on the tracking, several walleye and smallmouth bass used Nine Mile Creek from late September to late April, while Harbor Brook was not used by either species during the study. In general, the number of fish and total detections increased in the Lake Outlet following fall turnover. Correspondingly, active tracking in Onondaga Lake showed a simultaneous decline in the number of tagged fish present in the lake in October and November of 2010 and 2011. Results suggest that many tagged walleye and smallmouth bass leave the lake in the fall. Subsequently, sport fish such as walleye and smallmouth bass, may leave the lake with high contaminant burdens to systems where consumption advisories are not as stringent as those for Onondaga Lake.

Aquatic Invasive Species Prevention, Monitoring and Management in the Adirondack Park

Meghan Johnstone
Adirondack Park Invasive Plant Program

The Adirondack Park Invasive Plant Program (APIPP) is a regional partnership program operating in the 2.4 million hectare Adirondack Park in upstate New York and serves as the Adirondack Partnership for Regional Invasive Species Management (PRISM), one of eight in New York. Initiated in 1998 as a grass-roots effort, the program aims to protect the Adirondack region from the negative impacts of non-native invasive species and focuses on prevention, early detection, rapid response, management, and education. Invasive species management is most effective when addressed at the landscape level with the synergy of diverse partnerships. A coalition of more than 30 cooperating organizations, the APIPP has successfully incorporated this strategy by utilizing the strengths of each partner, organizing hundreds of volunteers and approaching the daunting issue of invasive species in a comprehensive, systematic, and cooperative manner that has produced real on-the-ground results. The Aquatic Invasive Species Project is one of APIPP's flagship programs. The program's successes include developing a regional volunteer monitoring program to detect aquatic invasive species; designing a regional database to store and track invasive species distribution information; recruiting and training nearly 600 staff and citizen volunteers to survey 300 lakes and ponds; developing educational materials to increase public awareness; and, promoting innovative spread prevention programs such as boat launch stewards. Continuing to work towards a complete and effective invasive species program, APIPP and partners recently implemented regional response teams to control new invasions in the Adirondack region. This presentation will discuss aquatic program goals, strategies, and activities and highlight ways in which partnerships and public involvement are essential to effective prevention, early detection, and management programs.

The use of Tactical Basin Planning to support watershed-based nutrient management

Neil Kamman and Ethan Swift
Vermont Department of Environmental Conservation

The Vermont Department of Environmental Conservation addresses nutrient pollution in surface waters via several approaches. The Department already implements the numeric and narrative nutrient criteria contained in VT's Water Quality Standards, and is currently working to develop more refined numeric nutrient criteria for wadeable streams and lakes. In addition, Vermont has recently promulgated a novel approach to nutrient management planning via the Vermont Surface Water Management Strategy (SWMS). This Strategy articulates management prescriptions for ten surface water stressors that result in pollutant loading to surface waters. To address nutrient impacted waters, the Department implements the prescriptions for three specific stressors: Channel Erosion, Land Erosion, and Non-Erosion Nutrient Loading. These actions are targeted geographically using monitoring and assessment data, and resulting intervention areas and BMP installations are listed in the implementation tables of Tactical Basin Plans. These Plans form the foundation for funding decisions of the Vermont's Ecosystem Restoration Program. This presentation will focus on the SWMS, stressor intervention approaches, tactical planning, and project funding to address nutrients.

The Use of QA in Vermont's LaRosa Volunteer Water Quality Partnership

James Kellogg
Vermont Department of Environmental Conservation

The LaRosa Laboratory Services Partnership allows volunteer watershed groups the opportunity to assess waters of interest to their groups and the State of Vermont without concern about the analytical costs. Laboratory analysis is one of the most expensive elements of a monitoring program and the VTDEC recognizes that analytical costs hinder the widespread application of volunteer surface water quality monitoring in Vermont. As such, we have eliminated this by issuing "slots for tests" at the State of Vermont's LaRosa Laboratory, free of charge to participants. The program even provides sample bottles and/or preservatives if required. The grant is competitive and there are eligibility requirements. Funds are not disbursed through this program, but a specified number of analyses are performed at no cost. While many programs do monitor ecoli at swimming holes, more and more are examining for nutrients, turbidity, chloride and even metals. The required p roject proposals are screened initially by the regional watershed coordinators as a first cut before a second review by the project coordinator. Often a third level of review is initiated for specific projects at the discretion of the project coordinator. Successful applicants that participate in the LaRosa Laboratory Services Program are required to complete a provided Quality Assurance Project Plan (QAPP) before sampling. The QAPP is a pre-approved "generic" QAPP that has met EPA approval and covers most of the activities likely to be carried out by a typical water quality sampling program. Each program builds in a recommended 10% QA consisting of field duplicates and blanks to assess field and lab performance. The volunteers can also expect a field audit at some point during their sampling season. A report is submited at the end of each sampling year that reviews their findings and accomplisments as well as tabulates their overall QAQC.

Salinization of lakes in the Adirondack Park by road salt

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Salinization of surface water from sodium chloride (road salt) is a widely recognized environmental concern, yet practical information to improve winter road management to reduce the environmental impacts of this deicer is lacking. The purpose of our study was to provide such information by developing baseline concentrations for sodium and chloride for lakes in watersheds without paved roads, and then determining the relationship between these ions and density, type, and proximity of paved roads to shoreline. We used average summer sodium and chloride data for 138 lakes combined in a watershed based analysis of paved road networks in the Adirondack Park. Median lake sodium and chloride concentrations in watersheds without paved roads averaged 0.55 and 0.24 mg/L, respectively. In contrast, the median sodium and chloride concentrations for lakes in watersheds with paved roads were 3.60 and 7.22 mg/L, respectively. Paved road density (lane-km/km2) was positively correlated with sodium and chloride concentrations, but only state roads were significantly correlated with sodium and chloride while local roads were not. State road density alone explained 84 percent of the variation in both ions. We also successfully modeled the relationship between road proximity to shoreline and sodium and chloride concentrations in lakes, which allowed us to identify sections of road that contributed more to explaining the variation in sodium and chloride in lakes. This model and our approach could be used as part of efforts to identify environmentally sensitive areas where alternative winter road management treatments should be applied.

Sustainability assessment of porous pavements in Central Park, NY

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Explore the viability by monitoring the performance of two recently installed porous pavement systems in Central Park. Compare the different pavement applications for reducing Combined Sewer Overflow volumes in New York City and associated water quality degradation. Holistically assess the sustainability of the technologies as compared to traditional pavement over the entire life cycle.

The National Water Census: Developing a National Framework for Serving Hydroecological Information to Stakeholders

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The primary objective of the US Geological Survey's National Water Census (NWC) is to place technical information and tools in the hands of stakeholders, allowing them to answer two primary questions about water availability hanging and integrating environmental observations, is being developed. This portal will integrate biological observations and streamflow data through the NHD+ spatial framework. Three Focus Area Studies are relating daily water withdrawals to changes in the abundance of fluvial specialists, estimating the extent of habitat needed to support aquatic species under different flow volumes and aquifer levels, and modeling the effects of alternative water management scenarios on habitat availability for key native species. Ultimately, these efforts will provide hydroecological information and transferable tools to facilitate eflow studies by allowing stakeholders, watershed managers, and environmental flow practitioners to link hydrology and biology at regional, state, or basin scales.

Using Bacteroidales quantitative real-time PCR for microbial source tracking of fecal well water contamination.

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Many residents in the US and in Canada use groundwater reserves as a primary source of drinking water. However, if a well is fecally contaminated, the use of private well water as a drinking source may pose a human health risk. The objective of this study was to identify the major source(s) of fecal contamination present in well waters of southeastern Ontario. Approximately 8500 private well water samples with unique geocodes and addresses were submitted to the Public Health Ontario Laboratory in Kingston, Ontario, for bacteriological analyses in 2012. 6.2% of these were E. coli culture positive.

Briefly, E. coli culture positive well water samples underwent membrane filtration. The DNA was extracted from the filter lysate using an automated EasyMag DNA extractor. Quantitative real-time PCR targeting the 16S rRNA gene of the order Bacteroidales was performed using the BacHuman, BacBovine and BacGeneral assays, described herein, using the a Life Tech nologies ViiA 7 platform. Descriptive and spatial analyses were performed on these results. The sources of contamination were 26%, 35%, 1% and 9% for general, human, bovine and both human/bovine assays, respectively, with 29% negative for all assays. Human contamination is possibly related to a lack of septic tank integrity, well and septic system proximity, age and/or depth of wells, and the supporting rock type. The low incidence of bovine fecal contamination supports the limited beef/dairy farming within the study area. Future work will focus on using molecular techniques to investigate the pathogenic nature of these fecal contaminants.

Dissolved nitrogen flux from 3 beaver ponds in southern Rhode Island

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Beaver ponds are increasingly prevalent on the landscape due to rising beaver populations. Ponds fill with fine and course organic material which may serve as a hotspot for nitrogen (N) transformations. We assessed the fate of N added to three beaver ponds, ranging from 0.01 to 9.9 hectares, in southern Rhode Island. Two ponds were less than 0.0001% of the watershed area while the largest pond, impounded in a headwater stream, was approximately 1% of total watershed area. Ten sediment cores from each pond were collected seasonally and incubated in a N mass balance study with 15N-labeled nitrate. After incubation, the soil was analyzed for total soil N, exchangeable inorganic N, and microbial biomass N. Beaver pond sediments across all incubations had the potential to remove a mean 52.7 g of N hectare-1 hour-1. After scaling the data to pond area, the largest beaver pond had mean nitrate removal potential of 360 g of N hour-1. The two other beaver ponds had mean nitrate removal potential of 2.8 g of N hour-1; N flux is related to pond size. Soil carbon and stream flow data results will be presented. Results from this study will lead to a better understanding of N cycling in beaver ponds and can be used in larger-scale modeling of N sinks. The potential of these wetland ponds as biogeochemical hotspots for denitrification and greenhouse gases will be useful for climate change models.

Freshwater Mussel Research and Monitoring for the Penobscot River Restoration Project

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The Penobscot River Restoration Project is one of the largest and most creative river restoration projects in our nation's history. In 2012, the Great Works Dam and a portion of an older submerged upstream "remnant dam" were removed, marking a major milestone in the historic effort to significantly improve access to historic habitat for sea-run fish and restore aquatic connectivity in the Penobscot River. Biodrawversity worked with the Penobscot River Restoration Trust and other state and federal agencies to develop and implement an Incidental Take Plan (ITP) for two state-listed mussel species known to occur upstream and downstream of the Great Works Dam: yellow lampmussel (Lampsilis cariosa) and tidewater mucket (Leptodea ochracea). One element of the ITP was a quantitative study of the mussel assemblage in the entire impoundment prior to dam removal; this will be repeated in 2013. A second element was a quantitative study of mussel assemblages in three monumented plots (25x50 meters) in

the impoundment prior to dam removal; this will be repeated in 2013 and 2014. A third element was relocation of mussels before and during the dam removal process; yellow lampmussels and tidewater muckets were tagged and moved to stable areas of the former impoundment. Relocated mussels were monitored throughout the dam removal process and will be checked in 2013 and 2014. This presentation provides an overview of what was accomplished in 2012, and what is planned for 2013 and 2014.

Monitoring New Hampshire's surface waters: A new approach to data collection and reporting

David E. Neils
NH Department of Environmental Services

Water monitoring strategies were required by EPA in the mid-2000s and were generally developed for 10 year timeframe. DES recently embarked on an effort to update its water monitoring strategy. The initiation of the revision was born out of a recognized need to unify its monitoring programs towards a common goal and maximize the use of the data that is collected. Current surface water quality monitoring by DES includes 10+ individual programs, some that have operated for 20 or more years, and collectively produce thousands of data points annually. The revision process identified weaknesses of its current approach to surface water monitoring and opportunities for more effective use of existing data. The revised strategy is organized around a 3-pronged design to surface water monitoring that includes probability, trend, and synoptic water quality surveys. The design establishes a structured mechanism to track the status and trends of its waterbodies while also maintaining a catalog of current data on individual waterbodies. The revised strategy attempts to optimize the use of existing staff resources and data in conjunction with new monitoring efforts to make better informed water management decisions and produce publicly consumable reports.

Harvesting Stream Biomonitoring Data from Citizen Monitors in NY State

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There is a large potential for Citizen Monitors to augment the NY State Department of Environmental Conservation's biological monitoring program. Without certification and significant experience, however, it is not possible for Citizen Monitors to conduct assessments equivalent to professional assessments. Instead, we have developed a limited, yet valuable, analysis that can be conducted by almost everyone. Wadeable Assessments by Volunteer Evaluators (WAVE) was successfully piloted in the Hudson River Watershed in 2012 and will hopefully be carried to other regions of the state in 2013. Similar to other citizen stream monitoring programs in our region, the participating citizens collect voucher collections of riffle dwelling benthic macroinvertebrates. These voucher collections serve as the primary data product and are identified to family by the WAVE coordinator. A simple presence/absence metric then categorizes each site as "no known impact" , "possibly impaired" or "other." The goals of this project are to identify high quality stream segments with "no known impact" for federal and state reporting processes and to identify possibly impaired stream segments which deserve further investigation at the professional level.

The frog of the north: mink frog ecology and climate change

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Populations of the cold-adapted mink frog, Lithobates septentrionalis, are likely to be highly threatened by climate change. Despite this concern, little is known about this species. The goal or our research was to evaluate the effects of climate change on the range and persistence of the mink frog. Specific objectives included (1) understanding how changes in water temperature and dissolved oxygen (DO) influenced larval survival; (2) establishing the current occurrence of this species in the Adirondack Park, NY; and (3) predicting the effects of climate change on the range and persistence of the species across its range. We initially employed a combination of laboratory studies and artificial mesocosms to determine relationships between aquatic conditions and growth and survival of larvae, and field studies at ~80 wetlands across an elevational and latitudinal gradient to evaluate the current occurrence of the species. Our results indicated that occurrence of the species was not solely a function of abiotic conditions in the aquatic environment, but likely driven by strong indirect effects of climate change. Based on these results we evaluated the role of climate-induced shifts in competition and predation using similar controlled experimentation. The results of these latter studies indicated that temperature-induced shifts in predator communities have the potential to dramatically influence survival of the focal species. Our results show that changes in amphibian populations as a result of shifts in global climate are likely to be driven by complex indirect effects across trophic levels.

Diatom community structure along a gradient of chloride impacted streams

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As roads and parking lots continue to proliferate, more and more road salt is applied each winter as a de-icer thus increasing conductivity and chloride concentrations in stream ecosystems. The effect of this increasing salinization on benthic communities is still largely unstudied. The diatom community, which is sensitive to small environmental changes, is ideal for establishing early indicators of salinization impacts before large scale shifts in stream community dynamics occur. In this study, 41 streams across Southern Ontario, Canada were selected to represent a chloride gradient. Benthic diatom assemblages were sampled in early May following complete snowmelt. Stream water chloride concentrations ranged from 5 to 502 mg/l. Diatom community structure was analyzed using multidimensional ordination and correlations with land use, water chemistry, biofilm stoichiometry, and other stream site characteristics. Conductivity and salinity are the major f actors driving diatom community composition. From this study, we will be able to propose diatom indicator species for road salt stress that could potentially be used for monitoring protocols.

Utilizing a Terrestrial Invasive Species Response Team for Landscape Level Management in the Adirondack Park

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Adirondack Park Invasive Plant Program (APIPP) and the Adirondack Chapter of The Nature Conservancy (TNC)

The Adirondack Park in New York is comprised of 2.4 million hectares of public and private lands that hold some of the most ecologically intact ecosystems in the United States. Most of the park remains relatively free of invasive species, which presents an exciting opportunity in conservation at a scale rarely seen anywhere else in the country. In 1998, a regional partnership of government and private organizations formed the Adirondack Park Invasive Plant Program (APIPP) to effectively manage invasive species at a landscape level. APIPP established an early-detection network utilizing citizen volunteers, state partners and non-governmental groups to map infestations across the region. Survey efforts showed that few invasive plants penetrated the interior of the park and infestations remained small so management could be effective, yet capacity for implementing controls was lacking. In the years that followed, APIPP sought funding to support a season al field crew dedicated to swift removal of those infestations and of new ones that became established. It was not until 2011 and 2012 that private funding enabled APIPP to formalize its regional response team approach. The team surveyed and treated in excess of 300 sites of priority species including Phragmites australis, Fallopia japonica and Lythrum salicaria. Photo documentation and spatial mapping of sites treated show steep declines in both acres infested and percent cover. Furthermore, out of 131 Phragmites sites treated since 2010, 37% had no signs of invasive plant recovery as of 2012. A summary of strategies used, work accomplished and lessons learned will be presented.

Influence of dietary carbon on mercury bioaccumulation in contrasting streams

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We studied lower food webs in streams of two mercury-sensitive regions to determine whether variations in consumer foraging strategy and resultant dietary carbon signatures accounted for observed variations in consumer mercury concentration. We collected macroinvertebrates and forage fishes from three sites in the Adirondack Mountains (New York), and three sites in the Coastal Plain (South Carolina), for analysis of mercury (Hg) and stable isotopes. Among primary consumers, scrapers and filterers had higher MeHg and more depleted d13C than shredders from the same site. Variation in d13C accounted for up to 34% of within-site variation in MeHg among primary consumers, beyond that explained by d15N, an indicator of trophic position. Consumer d13C accounted for 10% of the variation in Hg among predatory macroinvertebrates and forage fishes across these six sites, after accounting for environmental aqueous methylmercury (MeHg) and base-N adjusted consumer trophic position. The d1 3C spatial pattern within consumer taxa groups corresponded to benthic habitat shading. Consumers from relatively more-shaded sites had more enriched d13C (similar to typical detrital d13C), while those from the relatively more-open sites had more depleted d13C. Although we could not clearly attribute these differences strictly to differences in assimilation of carbon from terrestrial or inchannel sources, greater potential for benthic primary production at more open sites might play a role. These observations suggest that different foraging strategies and habitats influence MeHg bioaccumulation in

stream, and must be considered when selecting lower trophic level consumers as sentinels of MeHg bioaccumulation for comparison within and among sites.

Trees for Tribs: Lessons Learned Replanting the Streams of the Hudson Valley

Beth Roessler
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Since 2007, the The New York State Department of Environmental Conservation's Hudson Estuary Trees for Tribs program has engaged over 4,500 volunteers to replant 12 miles of streamside buffer using native tree and shrub stock from the New York State Tree Nursery. This riparian planting program provides land owners, watershed groups and local governments with free native planting materials and free technical assistance. The program's goals include both long term protection of water quality and wildlife as well as educating communities about values of stream corridors. We have tried to begin to assess our success through both plant survival data and partner feedback. This talk will introduce the accomplishments and challenges of this volunteer powered riparian planting program and how we are adapting our work as the program matures.

Integration of Volunteer Stream Monitoring Data into Connecticut 305(b) Assessments

Meghan Ruta
Connecticut Dept. of Energy & Environmental Protection

For fourteen years, the heart of Connecticut's volunteer stream monitoring program has been the Rapid Bioassessment in Wadeable Streams and Rivers by Volunteer Monitors (RBV) protocol. Developed by CT DEEP (then CT DEP) in 1999, RBV is intended to be a simple, non-technical, and educational protocol for volunteer monitoring groups interested in evaluating local water quality. Since its inception, the RBV program has expanded significantly. During its pilot period (1999-2000), a combined total of 7 volunteer groups utilized RBV to sample 32 sites on 25 Connecticut waterbodies. In comparison, during the fall 2012 monitoring season, 22 volunteer groups collected samples from 127 sites on 95 waterbodies. RBV has become an integral component of CT DEEP's Monitoring and Assessment Program. RBV serves as a reliable screening tool to identify high quality Connecticut waterbodies and helps fill spatial gaps in the Connecticut's monitoring program. (Thirty-three of the 2012 RBV sites were previously unstudied by the State.) Given the significant nature in which RBV data are used, CT DEEP maintains a comprehensive quality assurance and quality control (QAQC) program for its volunteer monitoring program. This presentation will review internal and external QAQC measures that have been utilized to-date, as well as discuss new QAQC elements proposed for implementation during the 2013 monitoring season. The Connecticut RBV program demonstrates that, with the appropriate amount of oversight and ongoing review and implementation of QAQC measures, it is possible for a State agency to successfully integrate volunteer monitoring data into 305(b) assessments.

Rhode Island's Approach to Developing Freshwater Numeric Nutrient Criteria (NNC)-Lakes and Streams

Jane E. Sawyers
NEIWPCC/RIDEM

Rhode Island has chosen to undertake NNC re-evaluation and development using state-specific data. Lakes in RI can be characterized as small and shallow, and a number of lakes are reservoirs or impoundments of riverine systems. To determine if there are different categories of lakes based on watershed and waterbody features, a unique method of categorizing Rhode Island lakes was applied using historical and primary data. The Bayesian treed (Btreed) model grouped lakes based on differences in the linear response of chlorophyll a and Secchi depth to the predictors, TN and TP. Initial results suggest only Secchi depth requires a division of different lake types before further statistical analysis for potential criteria values. Rhode Island's wadeable streams tend to be small and low gradient. A large deficiency identified in historical Rhode Island stream data is a lack of information on primary production. In other state and regional studies, the relationship between elevated nutrient concentrations and routinely measured biological response parameters has not always produced a discernible threshold that allows for identification of NNC. Therefore, Rhode Island targeted collection of a number of biological response variables (benthic chlorophyll a and diatom taxonomic composition) to address these potential issues and identify the best field methods and index period to use to observe biological responses. Initial application of field methods produced variable results, and field observations suggested that maximum biological response to nutrients occurs later in the field season and in non-algal primary producers.

Effective Urban Stormwater Management: Motivating Long-term Homeowner Behavior Changes to Prevent Water Pollution

Ross Saxton

Urban stormwater is a pervasive problem around the northeast and nation that plagues our public waterways and waterbodies with algal blooms, pathogen outbreaks, and toxic conditions. The economic implications are in the millions locally and billions regionally. As a society, we can arrest this pollution by adopting simple and effective practices at home. The BLUE® certification program motivates homeowners to adopt practices that prevent stormwater from leaving a roof, lawn, or driveway. When a homeowner agrees to follow the practices, their property is certified as watershed friendly, or BLUE®. If a pollution prevention feature such as a rain garden, rain barrel, downspout redirect, or similar best management practice is required for BLUE® certification, a mini-grant will be provided to the homeowner to assist with the cost of the feature. An annual follow-up audit ensures that practices continue to be followed. The BLUE® program is being implemented by Lake Champlain International (LCI) in five developed towns located within the Lake Champlain Basin since 2010. This presentation will discuss the process of creating the BLUE® program and implementing it as an on-the-ground and effective program that motivates the public to take action. The presentation will also describe how LCI is building a "BLUE Network" to establish long-term behavior changes in communities. As an ongoing program, strategies used to expand the reach of the program will also be discussed.

Multi-scale processes controlling the composition of insects in urban streams and the application to sustainable land-use management

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The "Urban Stream Syndrome" is a conceptual framework describing the complex process of how human activities at multiple scales (e.g., land-use change and direct alterations) directly or indirectly lead to poor quality habitat in stream ecosystems which then alters aquatic communities. Stream insects, however, do not solely interact with the aquatic environment; they complete important life history processes (mating and oviposition) and are highly dispersive during the adult terrestrial stage. Thus, terrestrial urban environments may play an important role in population growth, colonization, and local extirpation by increasing individual mortality, decreasing fitness, or preventing dispersal. We present work examining the effect of terrestrial urban landscapes on stream insect dispersal and the potential contribution of this regional process on community composition in urban streams. We found 1) that headwaters in urbanized landscapes received fewer immigrant caddisfly species than headwaters in more natural landscapes and 2) that dispersal limitation was contributing to species loss from larval communities in addition to poor in-stream conditions. An examination of community dissimilarity, environmental dissimilarity, and geographic distance between sample sites for a stream insect metacommunity across a partially urbanized landscape showed that both local (in-stream) and regional (constrained dispersal) processes controlled the composition of in-stream communities. Results also indicated that characteristics of urban landscapes that likely constrain dispersal alter the role of regional processes in controlling community composition. Dispersal constraints caused by urban landscapes have important implications for understanding how to best conserve stream biodiversity and promote sustainable land-use management.

Are yellow perch native to the Adirondacks? The DNA evidence.

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DNA was purified from samples of a 135 cm lake sediment core taken from Lower St. Regis Lake, Franklin County, NY. Yellow perch DNA was detected in sediment samples taken throughout the core, including the deepest sediments using polymerase chain reaction and targeting the DNA barcode gene (mitochondrial cytochrome oxidase subunit 1). Cloning and sequencing of this DNA verified its authenticity. To control for the possibility that yellow perch DNA is ubiquitous in the environment and not an indicator of presence of organisms, sediment DNA from Wolf Lake (believed not to contain yellow perch), several ephemeral pools in Franklin County, NY, and African lakes were analyzed. All such samples tested negative for presence of yellow perch DNA. This evidence suggests that yellow perch are native to upland lakes in the Adirondack Park.

A Tale of Two Lakes: Ice Records from Mirror and Placid.

Curt Stager
Natural Sciences Division, Paul Smith's College

Citizens of the Adirondacks have kept track of the freeze-up and ice-out dates on Mirror Lake and Lake Placid for most of the 20th century. Both records show long-term trends of decreasing ice cover which are consistent with rising temperatures that have also been recorded in the region. However, some notable differences between the ice patterns in the two lakes are also apparent. In this overview, the possible causes and implications of those differences are examined.

Status update on regional reference/climate change monitoring networks

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2 EPA's Global Change Impacts and Adaptation Group

With assistance from EPA's Global Change Impacts and Adaptation Group (GCIA) and Tetra Tech, states and EPA Regional offices in the northeast, mid-Atlantic, and southeast are taking steps towards developing regional monitoring networks to detect long-term, climate change–related impacts on aquatic communities in freshwater medium-high gradient wadeable streams. One of the goals is to initiate continuous temperature and flow sampling and annual biological sampling at targeted sites in each state. During this talk we will update you on the status of sampling efforts in each region. In addition, we will discuss the guidance document that GCIA, Tetra Tech and collaborators have written to facilitate more uniform and effective deployment of continuous temperature and water depth measuring devices at ungaged wadeable sites. We will also update you on discussions that are taking place on systems that could potentially be set up to allow data to be easil y shared across states.

Confronting CALM: Consolidated Assessment and Listing Methodology for 305b/303d reporting and the Mass Water Quality Standards

Gerald Szal, Christine Duerring
Massachusetts Department of Environmental Protection (MassDEP)

States and tribes are required by EPA to describe methods they use for reporting 305b assessments and 303d listing decisions with regard to designated uses including Aquatic Life. MA Surface Water Quality Standards (SWQS) have rather simplistic criteria for both D.O. and temperature. Within the last several years, however, we have been collecting large-scale datasets for both variables. We now have the ability to compare our fish and invertebrate data to long-term deploy information for D.O. and temperature. We are hopeful that comparisons between the two can help us better inform 305b assessments, refine our standards and increase our ability to put restoration and preservation efforts where they are most needed. Some preliminary data will be presented as well as ideas for future work.

An evidence-based approach to developing environmental flow needs for Great Lakes tributaries in New York

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The increasing alteration of river flows and the concomitant decline in freshwater biodiversity across the globe require development of environmental flow policies that are protective of river ecosystems. We are working with The Nature Conservancy and state and federal agency partners in the Northeast to develop flow management recommendations for streams in the Lake Ontario and Erie basins in New York and Pennsylvania. Our methodology involves synthesizing available information into ecologically based and socially acceptable goals for sustainable management of environmental flows. We identified nine fish and mussel target groups and forty flow ecology hypotheses through literature review and expert consultation during a series of workshops. We used causal criteria analysis, a form of systematic literature review, to assess the level of support from the published literature for each hypothesis and organized results across seasonal flow components. O ur results demonstrate the need for high, seasonal, and low flow protections across multiple seasons through strong support for at least one flow ecology hypothesis within each seasonal flow component. By articulating environmental flow needs through hypothesis development and systematic literature review, our evidence-based approach provides support for in-stream flow criteria currently being developed by the New York Department of Environmental Conservation

Investigation of trophic changes in Lake Minnewaska, a pristine sky lake in Ulster County, New York.

Lauren Townley
New York State Office of Parks, Recreation & Historic Preservation

In the 1990s and at the turn of this century, Lake Minnewaska had excellent water quality. Water clarity was very high, pH and nutrient levels were low, and the lake had a unique turquoise color. The lake also possessed unique biota, including a rare Sphagnum moss and two rare salamander populations. However, over the past decade, an increase in pH and the abundance of phytoplankton has been observed. In 2011, limnological surveys were conducted. Results from those surveys were compared to baseline data from surveys conducted over the past two decades. These surveys clearly demonstrated that the lake had transitioned to a eutrophic status. There was a massive algal bloom and surface pH rose to the highest levels ever recorded. Clarity dropped from historic levels of nearly 12 meters to 1 meter, and the color of the lake changed to a turbid green. Dissolved oxygen levels in the hypolimnion decreased substantially, reaching zero near the bottom for the first time. It is hypothesized that the potential causes for the substantial changes in Lake Minnewaska include a decrease in the acidity of precipitation and the introduction of a bait fish population (golden shiner), which has initiated a trophic cascade. A lack of a predator population has allowed for the golden shiner population to thrive, and is thought to be providing ideal nutrient conditions for phytoplankton growth. Another species of fish (large-mouth bass) was introduced illegally in 2012, and is likely to have additional major impacts to the lake's ecosystem.

Using Volunteer Water Quality Data in 305(b)/303(d) Clean Water Act Assessments

Ted Walsh
New Hampshire Department of Enviornmental Services

The New Hampshire Department of Environmental Services has two volunteer water quality monitoring programs – the Volunteer River Assessment Program (VRAP) and the Volunteer Lake Assessment Program (VLAP). These programs generate high quality data that is used by NHDES for 305(b)/303(d) reports, to supplement TMDLs, and to track long-terms trends in water quality. Through the use of vigorous QA/QC procedures these programs are able to generate data that is of the same quality as that collected by interns and/or staff. As the VRAP and VLAP programs have evolved these QA/QC processes have been embraced by the volunteers as it allows them to present scientifically sound data to municipalities, regional planners, and as part of applying for grants.

NYS DEC's approach to dealing with Harmful Algal Blooms (HABs)

Brad Wenskoski
New York State Department of Environmental Conservation

Harmful Algal Blooms (HABs) are increasing in frequency for an increasing number of water bodies in New York State, nationwide, and globally. Cyanobacteria, commonly referred to as blue-green algae, may produce harmful toxins and form harmful blooms. Large accumulations of cyanobacteria pose a threat to the ecological health of the aquatic system. HABs can negatively impact human health, water quality, fisheries resources, aesthetic and recreational enjoyment of these systems. NYS DEC has developed the HABs Monitoring and Assessment program to better understand the characteristics that are associated with increased occurrences of blooms and develop comprehensive internal and external communication products to streamline data collection and build public awareness.

THE NEW ENGLAND NON-WADEABLE RIVERS FISH ASSEMBLAGE ASSESSMENT PROJECT

Chris O. Yoder, Edward T. Rankin, and Lon E. Hersha
Midwest Biodiversity Institute

Field sampling for a fish assemblage assessment of the large rivers in New England occurred in 2008-9. A standardized raft and boat mounted electrofishing method that was previously developed and tested in Maine during 2002-7 was used to sample the fish assemblages of non-wadeable rivers. The probabilistic sampling design was derived from the 2008-9 National Rivers and Streams Assessment (NRSA) and adding an equal number of NRSA overdraw sites. Intensive surveys of selected mainstem rivers were also accomplished and provided the opportunity to compare the assessment outcomes of these different sampling designs. In terms of survey logistics, less that 10% of the original REMAP probabilistic sites were rejected. Reasons for rejection included sites being wadeable (the target was for raftable and boatable sites) and access and safety issues. The break point between wadeable and non-wadeable occurred at the Strahler order IV-V boundary with most or der IV sites being wadeable and most order V sites being non-wadeable, although a few exceptions did exist. A comparison of the assessment outcomes for both designs was also accomplished for the non-tidal portion of the Connecticut River. The probabilistic and intensive survey designs produced roughly comparable median values for New England and the Connecticut River. However, in both comparisons the intensive survey design uniquely found the highest quality sites and river segments in New England based on Maine River IBI scores and

accompanying Biological Condition Gradient (BCG) levels. BCG Level II scores were evident from the intensive survey design and most were located in northern and western Maine. No probabilistic sites had IBI scores above the BCG Level III. A first order analysis of stressors was also accomplished and limiting factors included hydrological, local habitat, location and number of barriers, and land use related factors. The gradients of disturb ance increased from north to south in New England and this corresponded to Maine IBI scores and other fish assemblage indicators.

CRITICAL ELEMENTS OF STATE BIOASSESSMENT PROGRAMS: A PROCESS TO EVALAUTE PROGRAM RIGOR AND COMPARABILITY - UPDATE FOR REGION I STATES

Chris O. Yoder
Midwest Biodiversity Institute & Center for Applied Bioassessment and Biocriteria

U.S. EPA has been developing and applying the use of biological assessments to more precisely define aquatic life uses and develop numeric biological criteria by working with federal agencies, states, academia, and non-government organizations since 1990s. As part of this effort, EPA has piloted the development and application of a process by which state and tribal biological assessment programs can identify the technical capabilities and the limitations of their biological assessment program and develop a plan to build on the program strengths and address the limitations. In February 2013, U.S. EPA released a document describing this process. This document is intended to be used as a "how to" manual to guide technical development of a biological assessment program capable of providing information to meet multiple water quality information needs. Water quality agencies can use the outcomes of the programmatic review to build as robust program s as their resources will allow. The process involves conducting on-site evaluations in which state or tribal staff and managers participate with EPA technical experts. Biological assessment program design, methods, and data interpretation are the major facets included in each evaluation. The result is a numeric score that is translated into one of four levels of program rigor. Level 4 is the highest rating and signifies that a state has developed the technical facets of their program to the point where refined uses and biocriteria can be used to effectively support water quality management programs. To date 23 states, 3 federal labs, and 1 tribe across the U.S. have been evaluated at least once. There is a strong relationship between the level of rigor and how a state uses biological assessment data. In states that exhibit a high level of rigor their bioassessment data is used to directly support multiple water quality management programs whereas states with lesser le vels of rigor generally emphasize status assessments for 305! b reporting and 303d listing purposes. There also is a correspondence between the level of rigor and whether a state has engaged in a serious process to develop and adopt ways to incorporate biological assessment data and indicators into their WQS. A unified effort to evaluate and report on the status of the New England states was concluded in 2010. This included a process for documenting progress, identifying technical development needs, and offering technical assistance. Conducting this process within a regional context offers additional opportunities for workshops, working groups, and informational exchanges that afford an opportunity to identify "best practices" and to work with states to improve their methods and assessment approaches. Some states have used this process as a springboard to initiate and guide their own and more detailed developmental efforts. Key aspects of those current efforts will be described.

Poster Abstracts

(Alphabetical order by primary author last name)

Stewarding of Temperature and Stage Sensors by Citizen Scientists

Katie Chang
VT EPSCoR

The VT EPSCoR Research on Adaptation to Climate Change (RACC) research program involves citizen scientists with the dual goal of engaging students in active research and creating a distributed data collection network. High school teams collect stream samples for nutrient and TSS analysis, and characterize macroinvertebrate communities. Beginning in 2012, high school student and teacher teams were also trained to steward temperature and stage sensors. New protocols and sensor housings were designed and put to the test this past year. This poster will provide an overview of our first season of sensor use, provide a look at preliminary data, and explore our next steps for improvements.

Using storm-watersheds to detect sources of pollution and prioritize land conservation areas at the local scale

Christina Chiappetta and Dr. John Davis
SUNY Albany

Planning and land use decisions in New York State are controlled at the municipal level, restricting the implementation of conservation practices to a local scale. This is not necessarily the best scale for conservation management. Watershed boundaries represent a more ecologically sound conservation unit, reflecting the natural scale of ecosystem processes rather than artificial political boundaries that blur the processes operating in separate ecological units. This problem is even more extreme in an urbanized system where watershed boundaries are compromised. Municipalities add stormwater infrastructure (including structures which capture, convey, and discharge flow) as-needed, often without regard for the natural drainage patterns dictated by topography. Storm-watersheds occur when stormwater infrastructure perforates municipal and watershed boundaries, creating man-made, "novel watersheds." The landscape impacts of stormwater runoff ca nnot be accurately assessed in a manipulated environment. This complicates Minimum Control Measure 3 (MCM3) of the SPDES Municipal Separate Storm Sewer Systems (MS4) Permit, illicit discharge detection and elimination of stormwater pollution. The objective of this study was to use a multi-criteria decision analysis to prioritize parcels for conservation, based upon principles of biodiversity conservation. Using a GIS, an index which evaluates the land's conservation value was developed. The Kromma Kill storm-watershed in Menands, NY was selected as a case study for the model. Both high and low priority conservation areas were selected to explore land use decisions in order to promote biodiversity. Using storm-watersheds to detect sources of pollution and high priority conservation areas is more accurate than using municipal or watershed boundaries alone.

Determining Escherichia coli contamination in Aquidneck Island watershed from host organisms

Brian Andrew Dagliere, Dr. Jameson Chace, Dr. Alison Shakarian

Abstract Recent research has discovered Escherichia coli in the Aquidneck Island Watershed in Newport Rhode Island. Using membrane filtration and mTEC agar plating, E.coli contamination has tested positive for the local water shed area. E.coli is a gram negative bacterium and is an effective lactose fermenter. E.coli is largely diverse and is host-specific. Fecal samples from humans, cows, sheep, geese, goats, horses, dogs, gulls, all differ in their E.coli. Animal fecal samples as well as E.coli was grown on MacConkey agar to isolate E.coli colonies due to its gram-negative bacteria and lactose fermentation .Using PCR with the (GTG) 5 primers, it is possible to identify the host species of the E.coli in the local watershed on Aquidneck Island.

Factors Influencing Homarus americanus Abundance and Distribution Along Newport Neck

James Diamantopoulos, Jameson F. Chace Ph.D, Sarah E. Matarese Ph.D, Caitlyn N. Farragher, William Kelly, Alexandra Igo

American lobster (Homarus americanus) are an important commercial fishery in Rhode Island. Long-term decline of annual landings is concerning, and the causes may be due, in part, to the North Cape oil spill of 1996, increased predation, pollution, and overfishing. Here we explore current population status in the undersampled near-shore rocky intertidal zones of Newport Neck and use habitat selection to model future lobster distribution and abundance with climate change. We tested the hypotheses that there would be an equal ratio of male to female lobsters and that lobster abundance would be evenly distributed. Using sets of vent-less traps we monitored once every four days in shallow near-shore habitat between Easton's Beach and Gooseneck Cove. There is a 3 rocky headwall areas, a trend especially strong among females. This distribution is probably related to larger substrate size and higher substrate heterogeneity. There was no significant difference in lobster captures per day between shallow and deep traps. Lobster abundance positively correlated species richness, perhaps and indirect measure of local productivity. Based on preliminary results, near-shore environments of Rhode Island are a principle habitat for undersized lobster males, who prefer higher habitat heterogeneity and productivity. Gravid females inhabit near-shore habitats – providing refugiae from trapping pressure. Future climate change sea level rise will impact available substrate of Newport Neck and affect lobsters. Based on present measures of lobster habitat selection, predictions of local lobster distribution/ abundance with climate change are possible.

Nutrient Flux, Anoxic Conditions and E. coli Contamination Across an Urban Watershed: Analysis of a Three Year Study on Aquidneck Island

Caitlyn N. Farragher, Alexandra Igo, Jameson F. Chase
Salve Regina University

Sound watershed management involves regular water quality testing, timely identification of point and nonpoint source pollutants, and effective remediation. The purpose of this study was to determine the dissolved oxygen, nitrates, phosphates, and E. coli contained in specific areas of the watershed on Aquidneck Island, RI. Since fall 2010 samples were collected from fifteen sites, using the LaMotte Octet Comparator kit for nitrates (1-10 ppm), phosphate (1-10 ppm), LaMotte dissolved oxygen titration for dissolved oxygen (ppm), and mTEC filtration system to estimate E. coli concentration. The data collected

over a three year period, shows, during the summer dissolved oxygen decreases from 0-5 ppm, from the winter when it ranges from 8-13 ppm. The source of this fluctuation is the cold temperatures and movement of the water during the winter. The slowing and drying out of the water sources during the summer is one explanation for the low dissolved o xygen levels. The nitrates followed the same pattern of increasing from 10-25 ppm during December through March, and decreasing from 0-5 ppm during April through November. The E. coli concentrations were the greatest in summer and downstream of the rivers contained higher concentrations. The source of nitrates and E. coli are most likely due to runoff of nearby farms and/or from suburban residences fertilizing their crops/lawns. Nitrates are absorbed during plant growth in the spring leading to eutrophic conditions and declining dissolved oxygen in summer. The local land trust has worked to promote conservation easements within the 50 m riparian buffer.

Lake Management in the Era of Uncertainty

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This paper hypothesizes that good lake management practices in the era of uncertainty (unpredictable climate patterns/resource gap) are directly correlated with the psychology of reasonable adaptation. Understanding of human psychology and how people learn through meaningful discourse at the scientific decisions/problem solving interface would benefit biologists, lake managers, as well as government and business entities. In my view, the neo-Vygotskian theory of teaching, schooling and literacy has evolved into a complete theory of education encompassing teaching, reasoning, schooling and literacy by Harvard theoretician Jerome Bruner. This paper illuminates educational practices/public policy related to lake and land-use conflicts. It emphasizes the adoption of both in-lake management (e.g., aeration, hypolimnetic oxygenation using innovative/advanced technology) and watershed nutrient control measures, as well as watershed ban on outmoded/unsus tainable development strategies (including outreach/education pertaining to adverse impacts of large dams and sedimentation) to ensure reasonable psychological adaptation to climate-uncertainty. The process of education, resolution of cognitive conflicts through discussions and psychological adaptation to valuable new information will need, on part of the learner, open-mindedness to consider current science and all variables/factors; indirect/alternative psychological adaptation also needs explaining away any threats experienced by a decision-maker, who may find neural assimilation of new knowledge not only challenging but also threatening to the sense of self. Empirical studies on self-affirmation by focusing on one's core independent values (unrelated to government or management decisions) bear promises in better management of lakes/rivers in local and trans-boundary watersheds.

Identification of human fecal pollution using liquid chromatographic-based detection of artificial sweeteners and PCR amplification of Bacteroidales

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Fecal contamination of surface waters from non-point sources is a significant health concern facing water regulators. To assess the potential human health risk and target remediation efforts, fecal source

tracking to identify the source of contamination is vital. Due to the potential unreliability of a single test, a "tool-box" approach to FST is supported. Host-specific chemical detection methods have recently been proposed to confirm results of PCR-based microbial analysis. Studies targeting artificial sweeteners are of particular interest due to their ubiquity in popular processed foods, non-metabolized excretion in humans, and lack of background levels in natural waters. This study compared the detection of host-specific Bacteroidales via PCR to a new liquid chromatography (LC) method targeting the artificial sweeteners acesulfame and saccharin. Water samples were collected from June-August, 2012 at 16 locations in the NYC watershed impacted by fecal contamination. Samples were analyzed for host-specific Bacteroidales while human contamination was evaluated by the detection of artificial sweeteners. Acesulfame was detected in 50% of samples and correlated with the detection of human-specific Bacteroidales 82% of the time. Saccharin was identified in only two samples, possibly indicating a recent fecal input event due to its short half-life in the environment. To date, LC results support the use of acesulfame as an independent indicator of human-specific fecal contamination of surface waters. This method shows promise as an important addition to the tool-box available for the identification of fecal contamination, thereby improving environmental decision making processes and protection of the public from waterborne disease.

Agricultural Practice Monitoring and Evaluation on Lake Champlain Basin Farms

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Stone Environmental, Inc.

Agriculture has been identified as a major contributor of phosphorus (P) to Lake Champlain. Although federal and state programs, as well as landowners, have made unprecedented investments implementing agricultural best management practices (BMPs), these efforts have not yet yielded the desired water quality results. There is an urgent need to evaluate and document the effectiveness of BMPs in the Lake Champlain Basin so that effective practices may be emphasized and assurance may be provided that plans to achieve P TMDL targets will be successful. In 2012, Stone Environmental, Inc. began working with the Vermont Agency of Agriculture, Food, and Markets to investigate the effectiveness of agricultural conservation practices applied to farm fields spanning the Vermont side of the Lake Champlain basin. At the six cooperating farms, a paired watershed study design is being used to test the effects of four different BMPs on event discharge and pollutant concentration and export in surface runoff from study fields. The study duration will be 3-5 years. Pairs of monitoring stations were constructed at each farm to measure and sample surface runoff flow. All stations are capable of two-way communication. After a significant rain event composite samples of runoff are split and analyzed for total phosphorus, total dissolved phosphorus, total nitrogen, total dissolved nitrogen, total suspended solids, and chloride. Hydrologic data are continuously posted to a dedicated website. Stone will monitor up to 20 events (weather permitting) per year of the study. Results will be presented for the September-December, 2012 monitoring period.

Does Sub-tidal Substrate Heterogeneity Predict Near Shore Marine Species Diversity?

A. Igo, S. Matarese, and J.F. Chace
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The richness and abundance of marine species, specifically macro invertebrates, is greatly dependent on the type of habitat available. Substrate heterogeneity was predicted to positively influence the diversity of marine organisms in the shallow water (< 5 m) of Newport Neck. Ten sites along Newport Neck were

chosen and each divided into three sub-sites, creating a total of thirty sampling locations. Modified lobster traps and small fish traps were placed at each site and species richness and abundance were recorded every three days. Divers estimated substrate size and diversity from 0.5 m^2 quadrats placed in sub-tidal zones at each trap location. A total of six species, including rock crabs (*Cancer irroratus*) and lobsters (*Homarus americanus)*, were identified along Newport Neck by our trapping efforts. Richness ranged from 1 to 6 species among all sites, with the highest richness at sites 6, 9, and 10. The most common species captured in the modified lobster traps were lobsters, spider crabs (*Libinia sp.*), and rock crabs. The most common species captured in small fish traps were perch (*Perca sp.*), Asian shore crabs (*Hemigrapsus sanguineus*) and small lobsters. Abundance ranged -8-15 individuals/trap day, with highest total abundance at sites 6, 9, and 10 and lowest at sites 2, 5 and 8. Based on these preliminary results, sites 10 and 6 had the overall highest species diversity (Simpson's Index = 1.44). We predict that sub-tidal substrate heterogeneity will be positively correlated with species richness, abundance and diversity. Understanding habitat selection of benthic near shore marine organisms today allows for modeling future distribution and abundance with sea level rise that is concomitant with climate change. From this, we can predict that future areas of high species richness and abundance will be in locations with the most heterogeneous rocky sub-tidal zone.

Conservation Genetics of New York's Giant Salamander: The Eastern Hellbender

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SUNY Buffalo State

The hellbender, Cryptobranchus alleganiensis, is North America's only giant salamander and is endemic to the eastern United States. Like many species of amphibians worldwide, hellbender populations are declining at alarming rates. Management efforts are essential to the continued survival of the hellbender. The Buffalo Zoo is raising hellbenders collected from the wild by the New York State Department of Environmental Conservation. These animals will be released back into the wild in an attempt to increase the overall population size. In order to understand the impact these animals will have on extant populations, both the genetic structure of the wild populations and the genetic composition of the released animals must be determined. Unfortunately, little is known about the genetic diversity and structure of hellbenders in New York. Therefore, this study used nine microsatellite loci to assess the genetic relationships of over 200 hellbenders from various locations throughout the Allegheny River drainage of New York and Pennsylvania and of the captive-raised individuals from the Buffalo Zoo. Based on previous research, hellbenders from different drainages differ strongly, while those from the same drainage are genetically similar. However, we found significant genetic differences between Allegheny tributaries. These genetic differences have implications for management as releasing captive-raised animals may alter the genetic structure of subpopulations.

LINKING AQUATIC COMMUNITIES TO ENVIRONMENTAL VARIABLES: AN EVALUATION OF CONCORDANCE BETWEEN FISH AND MACROINVERTEBRATE ASSEMBLAGES

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Assessments of stream quality often use a single biotic assemblage to determine the environmental and anthropogenic stressors exerting the greatest influence on the ecological integrity of the system. However, the responses of different taxonomic groups to various environmental factors often differ. Community concordance tests the similarity in community patterns in different taxonomic groups

collected from the same areas. High degrees of concordance suggest that different taxonomic groups respond similarly to environmental conditions, and that one taxonomic group could presumably be used to predict the response of the other. Community concordance was evaluated for fish and macroinvertebrate assemblages at select locations in the Onondaga Lake Watershed (Onondaga County, NY) in an attempt to detect patterns in community composition. Canonical Correspondence Analysis (CCA) was used to detect gradients in species composition and environmental vari ables for each assemblage. Local variables, such as water chemistry and stream morphometry were consistently significant ($p < 0.05$) for fish for all sample years. Land use and stream conductivity were consistently significant ($p < 0.05$) to macroinvertebrates for all sample years. Concordance between assemblages was weak for all sample years and not significant ($p > 0.05$). Despite differences in the response of each group to environmental variables, both assemblages displayed a similar rural-urban gradient in composition; from cool-water, pollution intolerant species (rural) to warm-water, pollution tolerant species (urban). Results suggest that the lack of community concordance between fish and macroinvertebrate communities may be due to differences in the scale at which environmental variables are influencing these assemblages.

Using otolith microchemistry to discern fine scale movement of brown trout (Salmo trutta) in a polluted urban system

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Analysis of trace elements in otoliths can be an extremely useful tool for researching fish migration. In many cases, however, this type of analysis is limited to species which undergo long migrations or span large natural changes in water chemistry. This study attempted to discern fine scale movement based on anthropogenic alterations in water chemistry and abrupt natural gradients within the Onondaga Lake watershed. Using synchrotron-based scanning X-ray fluorescence microscopy, we analyzed eight brown trout (Salmo trutta) otoliths for trace elements. To determine watershed chemistry we performed a synoptic survey of trace elements in four lake tributaries. Through Se, Sr, Mn, Mg, Ba and Zn concentrations in otoliths, we were able to infer seasonal migration patterns between the lake and adjacent tributaries. We found high levels of selenium and strontium indicative of lower Onondaga Creek residence in some growth increments, as well as manga nese, possibly taken up in Ninemile Creek, in others. Understanding the ways in which this cold water species utilizes the lake could help guide future lake restoration initiatives, such as the re-introduction of Atlantic salmon.

Cost and effectiveness of hand harvesting to control the Eurasian watermilfoil population in Upper Saranac Lake, New York

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An intensive hand harvesting project was undertaken to achieve whole lake control of Eurasian watermilfoil in Upper Saranac Lake, New York. Beginning in 2004, six crews of divers hand harvested the entire littoral zone of Upper Saranac Lake twice per summer for three years, after which the harvesting effort was scaled down in a maintenance configuration. Eurasian watermilfoil cover and removal data was collected by the crews and the process was also monitored using permanent underwater transects to track the Eurasian watermilfoil response to management. Eurasian watermilfoil cover was reduced to rare (<5% cover) for over 90% of the littoral area and plant removal decreased from about 16,640 kg in

2004 to 460 kg in 2006, the final year of intensive management. Eurasian watermilfoil density for the transects dropped from 1,650 stems/ha (± 343 S.E) in August 2004 to 63 stems/ha (± 9.26 S.E.) in August 2006, with similarly low density during the mainte nance period. Labor cost averaged $728 ha/yr during intensive management and $303 ha/yr during the maintenance period. Results indicate that hand harvesting is a viable management technique for achieving whole-lake control of Eurasian watermilfoil; however, successful use of hand harvesting requires a large financial investment and a commitment to control in perpetuity.

Advances in PCR-based methods used for microbial source tracking

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Bacteroidales are anaerobic fecal indicator bacteria used to discriminate human, mammalian, and avian fecal pollution in surface waters. As anaerobes, their stability in the environment is thought to be limited, so they have been proposed as an indicator of recent fecal contamination. The goals of this study were to examine the survivability of Bacteroidales in environmental samples by i) increasing the sensitivity of PCR-based detection of Bacteroidales through initial enrichment of concentrated water samples in anaerobic media and ii) optimizing a DNA extraction method for use in downstream PCR-based analyses. Sample enrichment prior to PCR amplification resulted in the identification of Bacteroidales in a sediment sample from an impacted Lake Ontario beach after 135 days refrigeration. These results are important because they show that these anaerobes are detectable for a lengthy period of time after a fecal contamination event, pointing to the potential for incorrect identification of contamination source under conditions causing the resuspension of sediments in the water column. PCR-based detection of Bacteroidales was compared after DNA isolation using bead beating-based cell lysis, bead beating-based cell lysis followed by MagNA Pure DNA extraction, high temperature cell lysis followed by MagNA Pure extraction, and freeze/thaw-based cell lysis, followed by MagNA Pure extraction. Initial results indicated that bead beating yielded the highest concentrations of DNA but also resulted in inhibition of PCR amplification. Cell lysis accomplished using either freeze/thaw or high temperature prior to MagNA Pure DNA extraction increased the sensitivity of Bacteroidales detection using conventional PCR-based analysis.

Exploration of current and historic data to inform management strategies for exotic invasive and native macrophyte control at Rudd Pond, in Taconic State Park, Dutchess County, New York.

Gabriella Cebada Mora

Rudd Pond is a natural 64-acre freshwater pond located in the Rudd Pond Area of Taconic State Park, just north of the Village of Millerton in Dutchess County. Rudd Pond serves as the main feature of the park and provides the public with swimming, non-motorized boating, and fishing. The pond is extremely shallow, having a maximum depth of 14 feet and an average depth of 4 and contains both federal and state designated wetlands. Currently, excessive growth of both native and exotic invasive aquatic plants has impaired the recreational uses and aesthetics of the pond. High plant densities are found throughout the pond, which includes exotic invasives Eurasian Watermilfoil (Myriophyllum spicatum) and Curlyleaf Pondweed (Potamogeton crispus). Eurasian Watermilfoil was among the most abundant and dense plants, along with the native plants Common waterweed (Elodea Canadensis) and Coontail (Ceratophyllum demersum). The pond has shifted from a mesotrophic status to eutrophic. Excessive plant growth, stimulated by sediment and nutrient inputs, is seen as contributing to depleted dissolved

oxygen levels in bottom waters and fish die offs. Historic data, dating back to the late 1920s, has provided information on a variety of past management actions and concerns, as well as an understanding of the natural and cultural changes that have influenced Rudd Pond. Public interest along with historic records, current monitoring, multi-agency involvement, and consideration of future environmental and ecosystem changes are being used to inform management strategies to improve patron experience and the health of Rudd Pond.

The Hudson River Environmental Conditions Observing System

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In 2008, the Hudson River Environmental Conditions Observing System (HRECOS) was established to provide high-frequency, real-time data that are geographically distributed across large rivers in the Hudson River watershed. HRECOS consists of water quality and weather stations operated by a consortium of partner institutions from the government and research community who collaborate to report data in real time to a public website (www.hrecos.org). HRECOS builds upon existing monitoring and observing activities on the Hudson River estuary, including the Hudson River National Estuarine Research Reserve System-wide Monitoring Program (SWMP), the U.S. Geological Survey, the NYS DEC Rotating Integrated Basin Studies, and modeling and monitoring efforts undertaken by Stevens Institute of Technology in the New York – New Jersey Harbor. The goals of HRECOS are to provide baseline monitoring data necessary for applied research and modeling, to improve the capacity of research entities to understand the ecosystem and manage estuarine resources, to provide policy makers with timely data products to guide decision making, and to support the use of real-time data in educational settings. Recently HRECOS expanded to include new stations at Pier 84 in New York City and at Utica in the Mohawk River. New software was also added to provide flood warnings for the Stockade District of Schenectady to the Schenectady Office of Emergency Management.

Effects of Flow Alteration on Stream Health across the Atlantic Highlands Ecoregion – Study Design

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The Atlantic Highlands are well-suited for a study of effects of streamflow modification on aquatic ecosystems because of its large number of streamgages, broad expanses of forested watersheds, extensive flow modifications, and stressor-sensitive biotic assemblages. We are designing a study to quantify streamflow alteration across the area, and to describe how these alterations are related to the health of aquatic ecosystems. Here, we outline the study as currently proposed to facilitate input on its design and to promote ideas on collaboration with stakeholders. During 2013, sites will be selected to characterize a range of flow modifications across the study area. Sites will be near active USGS streamgages (operated for at least 10 years) and have watersheds with minimal developed land. Co-location with other active studies (e.g., WaterSMART) will be a priority. The ecology of sites will be evaluated based on surveys of algal, macroinvertebrate, and fish assemblages; stream habitat; water-

quality field parameters, and water samples for chemical analysis. Temperature probes will be used to quantify thermal regimes. Hydrologic data from streamgage records will be used to calculate hydrologic metrics for each site. These measured values will be compared with modeled unaltered streamflow values, and flow alteration will be quantified as departure from natural conditions. Thermal alteration at each site will be quantified using a similar approach. Algal, macroinvertebrate, and fish assemblage data will be used to calculate selected metrics and indices, which will be examined in relation to hydrologic alteration and associated alteration of thermal regimes, habitat, and water chemistry.

Removal of endocrine disrupting compounds from the aquatic environment by the water fern Azolla

Anne Roberts, Sandra Nierzwicki-Bauer, Chuck Boylen

Endocrine disrupting compounds (EDCs) are an environmental contaminant of great concern as EDCs can cause negative effects on reproductive health in many organisms even at low concentrations. The water fern Azolla has been shown to successfully remediate organic compounds from the aquatic environment, such as the surfactant sodium dodecyl sulfate. To determine if Azolla is a viable candidate for the removal of EDCs from the aquatic environment, plants were grown in IRRI media containing approximately 100 ppb 17β-estradiol. This extremely low dose of 17β-estradiol mimics environmentally relevant concentrations of EDCs to which the fern would likely be exposed. Using a Yeast Estrogen Screen (YESne) to determine levels of EDCs in the media, statistically significantly less EDCs were found in treatments with plants as compared to the controls lacking plants after 14 days. Future studies are described to determine if the fern is actively removing the EDCs or breaking down the compounds into a form that is unable to bind to the human estrogen receptor found in the YESne.

Habitat Affinity Model and Meaningful Regulatory Thresholds for New York State Streams

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The objective of this study is to develop a habitat model affinity (HMA) metric for use in assessing habitat information for wadeable streams in New York State. Two models have been developed, one for high gradient and one for low gradient streams. The models will allow streams to be compared to determine percent similarity. Based on this similarity; the water quality and benthic community structure can be estimated. The models have been developed based on reference sites identified using data collected by the New York State DEC's Stream Biomonitoring Unit including chemical and land use variables. The reference condition is the model by which percent similarity score can be calculated using habitat scores from other streams. The high gradient model has a total score of 187, while the low gradient model has a total score of 149 and is provisional until more data is collected. The models are being tested against a new dataset to determine if there a re correlations to biological conditions, water chemistry and land use data. Meaningful regulatory thresholds for impairment will be developed for which the site percent similarity scores can be compared to establish a level of quality of stream and surrounding riparian habitat.

Environmental DNA based surveillance of aquatic invasives.

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Species-specific detection of environmental DNA was explored for its potential as a rapid, sensitive and economical surveillance method for invasive bivalves. Water samples taken from five of seven lakes in New York State reported to be infested tested positive for zebra mussel (Dreissena polymorpha) DNA, and water samples from four lakes within the Adirondack Park not previously known to be infested also tested positive. Further eDNA testing was conducted on these four lakes, including testing of littoral sediment and biofilms. Both sediment and biofilm tested positive for zebra mussel eDNA in one such lake (Chateaugay Lake, Franklin County, NY), and in another such lake (Long Pond, Essex County, NY), four of six littoral sediment samples tested positive. The majority of lakes in the Adirondack Park are at risk for Asian clam (Corbicula fluminea) infestation based on water chemistry. We developed a species-specific eDNA test, and Asian clam eD NA was detected in littoral sediments from water bodies known to be infested. Sediment eDNA will be further explored as a consistent and reliable indicator of invasive bivalve presence in a water body.

Stream Monitoring to Identify Impacts of Oil and Gas Extraction within Allegany State Park Watersheds

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Beginning in 2010 the Pennsylvania Department of Environmental Protection issued hundreds of well permits within the Allegheny National Forest which is adjacent to and includes streams in the watershed of Allegany State Park, Cattaraugus County, New York. Based on the need to protect the water quality and aquatic ecosystems of New York's largest State Park, a stream water quality monitoring program was developed and initiated in May 2010. The goal was to develop an inexpensive, quality monitoring program to provide baseline water quality data and to document impacts related to oil and gas extraction activities. The monitoring program includes weekly monitoring of stream conductivity, temperature, salinity, turbidity, pH, velocity and other field observations. The presence of oil in the water is tested in the field using a novel, inexpensive approach with a hand held black light. Laboratory analyses are used to further assess unusual or high field results. Results to date indicate that streams in watersheds undergoing road building and drilling activities have higher conductivity and turbidity levels. The monitoring program has resulted in five enforcement actions against an oil company by the NYS Department of Environmental Conservation for temporary visual impacts to a stream. It also demonstrates environmental impacts downstream of extractive activities, of which extraction companies and regulatory authorities should take notice. These monitoring methods obtain quality data and determine water quality impacts with limited funding and may prove to be useful to others as additional oil and gas wells are drilled across the northeast.

Comparing Vernal Pool Productivity After Transmission Line Construction; Do Buffers Minimize the Effects of Habitat Fragmentation?

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Vernal pools provide critical habitat for a wide variety of animal species including the indicator amphibian species (Rana sylvatica, Ambystoma laterale, A. maculatum). It is widely presumed that indicator amphibian species respond negatively to overstory removal. Studies analyzing the effects of various canopy and buffer treatments have concluded varying degrees of impact on the initial and long term use of the indicator amphibian species in altered areas surrounding vernal pools. In recent years the number of transmission lines and pipelines being constructed or proposed for construction in the Northeast has increased significantly. New utility corridors, even when co-located, can substantially change the landscape around vernal pools. These developments are often sited in relatively undeveloped habitat blocks resulting in fragmentation and direct impact to habitat for amphibians and reptiles. Pre and post-utility line construction on vernal pool surveys were conducted on 11 vernal pools in northern Maine. Pools were visited twice during appropriate seasonal conditions, once early in the season to capture wood frog egg mass abundance and once two weeks afterwards to capture salamander egg mass abundances. Highly productive pools are given a "significant" status based on the number of egg masses of each of the indicator species and there are limits to the amount of clearing which can occur in the critical terrestrial habitat surrounding them. The productivity standards of the significant pools was established by the State of Maine in accordance with the scientific experts on vernal pools in Maine. Orthophoto analysis pre and post construction have assessed the forested buffer impacts at varying buffer widths according to known biological terrestrial habitat zones and regulatory guidelines and vernal pool best management clearing practices. Our research analyzes the indicator amphibian abundance pre- and p ost- forested buffer alteration from 2007 through 2012 with ! the percentage of canopy closure pre and post construction. Initial results indicate that the percentage of forested impact is not negative correlated to amphibian yearly larvae productivity. Many states in the Northeast seek to protect vernal pools and their critical terrestrial habitat area with best management practices or minimum standards for vernal pools encountered and crossed by a utility corridor. Based on this research we will discuss the role of these BMPs and minimum standards and if productivity is affected by these measures.

Overview of Paul Smith's College's Watershed Stewardship Program

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Paul Smith College Watershed Stewardship Program

Paul Smith's College's Watershed Stewardship Program (WSP) is the education and outreach aspect of Paul Smith's College's Adirondack Watershed Institute (AWI). The WSP began in 2000 as a local watershed-focused effort to interpret the environment, perform environmental service work, monitor ecological conditions and prevent the introduction of aquatic invasive species (AIS) into the St. Regis Lake chain, which is adjacent to Paul Smith's College. Throughout the 13 years of the program's existence, WSP staff has collaborated closely with The Nature Conservancy, the Adirondack Park Invasive Plant Program, the New York State Department of Environmental Conservation, the Lake Champlain Basin Program, the Lake George Association, numerous property owner associations, and scientists at Paul Smith's College to guide the evolution of a program that serves the needs of local human and biotic communities. As a result, the WSP now serves as a mod el across the state for AIS

spread prevention and outreach. The Environmental Protection Agency awarded the WSP with funding to continue and expand the program for the 2012 field season. In 2012, stewards were stationed at 24 different boat launches across the Adirondack Park. The WSP's 26 Watershed Stewards kept busy inspecting a total of over 24,000 boats and imparting an invasive species awareness message to almost 50,000 people. Stewards inspected 489 boats in 2000, over a 40-fold increase to date. Over 88,000 boats have been inspected in the WSP's 13-year history.